

Amendments to the claims

This listing of claims replaces all prior versions and listings of claims:

1. (Original) An ultra wideband radio transmitter comprising:
 - a delay time controller for generating a periodic pulse, inputting the periodic pulse to a first matched filter, outputting the periodic pulse to a second matched filter when transmission data has a first level out of 2 logical levels, outputting the periodic pulse to a third matched filter when the transmission data has a second level out of the 2 logical levels;
 - the first matched filter for outputting a reference signal that becomes a data decision criterion when the periodic pulse is input thereto;
 - the second matched filter for outputting a first data signal a predetermined time ahead of the reference signal when the periodic pulse is input thereto;
 - the third matched filter for outputting a second data signal a predetermined time behind the reference signal when the periodic pulse is input thereto;
 - an adder for adding up outputs of the first to third matched filters;
 - a local oscillator for outputting a local signal for frequency-converting a corresponding addition signal at a high frequency band or a low frequency band;
 - a mixer for receiving the addition signal and the local signal, and frequency-converting the corresponding addition signal; and
 - an antenna for receiving the frequency-converted addition signal and radiating the corresponding signal in the air.
2. (Original) The ultra wideband radio transmitter of claim 1, wherein the reference signal, the first data signal and the second data signal each are a pattern signal comprised of several periodic pulses.
3. (Currently amended) An ultra wideband radio receiver comprising:
 - an antenna for receiving a radio wave signal; a local oscillator for outputting a local signal for frequency-converting the radio wave signal;
 - a mixer for receiving the radio wave signal and the local signal, and frequency-converting the radio wave signal;
 - a first matched filter for receiving the frequency-converted radio wave signal, and outputting a first output signal when a reference signal that becomes a data decision criterion

is detected therefrom;

a second matched filter for receiving the frequency-converted radio wave signal, and outputting a second output signal when a data signal is detected therefrom;

a delay time measurer for detecting which of the first output signal and the second output signal has been first output from the first and second matched filters, and outputting a corresponding detection result; and

a data decider for receiving the detection result and deciding whether the data signal has a first level or a second level out of 2 logical levels,

wherein the delay time measurer comprises a first circuit for receiving the first output signal and calculating a square value or an absolute value of the first output signal, a second circuit for receiving the second output signal and calculating a square value or an absolute value of the second output signal, a first latch for receiving and setting a output signal of the first circuit, a second latch for receiving and setting a output signal of the second circuit, a first memory for reading a output signal of the second latch as the detection result by receiving a output signal of the first latch, a second memory for reading the output signal of the first latch as the detection result by receiving the output signal of the second latch, and a reset section for outputting a reset signal by receiving outputs of the first and second latches.

4. (Original) The ultra wideband radio receiver of claim 3, wherein the reference signal and the data signal each are a pattern signal comprised of several periodic pulses.

5 - 6. (Cancelled).

7. (Currently amended) An ultra wideband radio transmitter including a first radio section for performing data communication using a first frequency, a second radio section for performing data communication using a second frequency being different from the first frequency, and an interface section for allocating transmission data to the first and second radio sections, comprising:

the first radio section including;

a first delay time controller for generating a periodic pulse by receiving transmission data allocated by the interface, inputting the periodic pulse to a first matched filter, outputting the periodic pulse to a second matched filter when the transmission data has a first level out

of 2 logical levels, and outputting the periodic pulse to a third matched filter when the transmission data has a second level out of the 2 logical levels;

the first matched filter for outputting a reference signal that becomes a data decision criterion when the periodic pulse is input thereto;

the second matched filter for outputting a first data signal a predetermined time ahead of the reference signal when the periodic signal is input thereto;

the third matched filter for outputting a second data signal a predetermined time behind the reference signal when the periodic pulse is input thereto;

a first adder for adding up outputs of the first to third matched filters; and a first antenna for receiving a corresponding addition signal and radiating the addition signal in the air; and

the second radio section including;

a second delay time controller for generating a periodic pulse by receiving transmission data allocated by the interface, inputting the periodic pulse to a **fourth** ~~third~~ matched filter, outputting the periodic pulse to a **fifth** ~~fourth~~ matched filter when the transmission data has a first level out of 2 logical levels, and outputting the periodic pulse to a **sixth** ~~fifth~~ matched filter when the transmission data has a second level out of the 2 logical levels;

the **fourth** ~~third~~ matched filter for outputting a reference signal that becomes a data decision criterion when the periodic pulse is input thereto;

the **fifth** ~~fourth~~ matched filter for outputting a first data signal a predetermined time ahead of the reference signal when the periodic signal is input thereto;

the **sixth** ~~fifth~~ matched filter for outputting a second data signal a predetermined time behind the reference signal when the periodic pulse is input thereto;

a second adder for adding up outputs of the third to fifth matched filters;

a local oscillator for outputting a local signal for frequency-converting a corresponding addition signal from the first frequency to the second frequency;

a mixer for receiving the addition signal and the local signal, and frequency-converting the addition signal; and

an antenna for receiving the frequency-converted addition signal and radiating the corresponding signal in the air.

8. (Currently amended) An ultra wideband radio receiver including a first radio

section for performing data communication using a first frequency and a second radio section for performing data communication using a second frequency being different from the first frequency, comprising:

- a first antenna for receiving a radio wave signal and outputting the received radio wave signal to a first matched filter and a second matched filter;

- the first matched filter for receiving a signal from the first antenna, and outputting a first output signal when a reference signal that becomes a data decision criterion is detected therefrom;

- the second matched filter for receiving a signal from the first antenna, and outputting a second output signal when a data signal is detected therefrom;

- a first delay time measurer for detecting which of the first output signal and the second output signal has been first output from the first and second matched filters, and outputting a corresponding detecting result; and

- a first data decider for receiving the detection result, and deciding whether the data signal has a first level or a second level out of 2 logical levels; and

- the second radio section including;

- a second antenna for receiving a radio wave signal; a local oscillator for outputting a local signal for frequency-converting the radio wave signal;

- a mixer for receiving the radio wave signal and the local signal, and frequency-converting the radio wave signal;

- a third matched filter for receiving the frequency-converted radio wave signal, and outputting the first output signal when a reference signal that becomes a data decision criterion is detected therefrom;

- a fourth matched filter for receiving the frequency-converted radio wave signal, and outputting the second output signal when a data signal is detected therefrom;

- a second delay time measurer for detecting which of the first output signal and the second output signal has first been output from the third and fourth matched filters, and outputting a corresponding detection result; and

- a second data decider for receiving the detecting result, and deciding whether the data signal has a first level or a second level out of 2 logical levels,

wherein the first or second delay time measurer comprises a first circuit for receiving the first output signal and calculating a square value or an absolute value of the first output signal, a second circuit for receiving the second output signal and

calculating a square value or an absolute value of the second output signal, a first latch for receiving and setting a output signal of the first circuit, a second latch for receiving and setting a output signal of the second circuit, a first memory for reading a output signal of the second latch as the detection result by receiving a output signal of the first latch, a second memory for reading the output signal of the first latch as the detection result by receiving the output signal of the second latch, and a reset section for outputting a reset signal by receiving outputs of the first and second latches.

9. (Currently amended) An ultra wideband radio transmitter including a first radio section for performing data communication using a first frequency, a second radio section for performing data communication using a second frequency being different from the first frequency, and an interface for allocating transmission data to the first and second radio sections, comprising:

the first radio section including;

a first delay time controller for generating a periodic pulse by receiving transmission data allocated by the interface, inputting the periodic pulse to a first matched filter, outputting the periodic pulse to a second matched filter when the transmission data has a first level out of 2 logical levels, and outputting the periodic pulse to a third matched filter when the transmission data has a second level of the 2 logical levels;

the first matched filter for outputting a reference signal that becomes a data decision criterion when the periodic pulse is input thereto;

the second matched filter for outputting a first data signal a predetermined time ahead of the reference signal when the periodic pulse is input thereto;

the third matched filter for outputting a second data signal a predetermined time behind the reference signal when the periodic pulse is input thereto;

a first adder for adding up outputs of the first to third matched filters; and

a first antenna for receiving a corresponding addition signal, and radiating the addition signal in the air; and

the second radio section including;

a second delay time controller for generating a periodic pulse by receiving transmission data allocated by the interface, inputting the periodic pulse to a **fourth** ~~third~~ matched filter, outputting the periodic pulse to a **fifth** ~~fourth~~ matched filter when the transmission data has a first level out of 2 logical levels, and outputting the periodic pulse to a

~~sixth fifth~~ matched filter when the transmission data has a second level of the 2 logical levels;

the ~~fourth third~~ matched filter for outputting a reference signal that becomes a data decision criterion when the periodic pulse is input thereto;

the ~~fifth fourth~~ matched filter for outputting a first data signal a predetermined time ahead of the reference signal when the periodic pulse is input thereto;

the ~~sixth fifth~~ matched filter for outputting a second data signal a predetermined time behind the reference signal when the periodic pulse is input thereto; a second adder for adding up outputs of the third to fifth matched filters;

a local oscillator for outputting a local signal for frequency-converting a corresponding addition signal from the first frequency to the second frequency; and

a mixer for receiving the addition signal and the local signal, frequency-converting the addition signal, and outputting the frequency-converted addition signal to the first antenna.

10. (Currently amended) An ultra wideband radio receiver including a first radio section for performing data communication using a first frequency and a second radio section for performing data communication using a second frequency being different from the first frequency, comprising:

a first antenna for receiving a radio wave signal and outputting the received radio wave signal to a first matched filter, a second matched filter, and a mixer in the second radio section;

the first matched filter for receiving a signal from the first antenna, and outputting a first output signal when a reference signal that becomes a data decision criterion is detected therefrom;

the second matched filter for receiving a signal from the first antenna, and outputting a second output signal when a data signal is detected therefrom;

a first delay time measurer for detecting which of the first output signal and the second output signal has been first output from the first and second matched filters, and outputting a corresponding detecting result; and

a first data decider for receiving the detection result, and deciding whether the data signal has a first level or a second level out of 2 logical levels; and

the second radio section including;

a local oscillator for outputting a local signal for frequency-converting a radio wave signal received from the first antenna;

a mixer for receiving the radio wave signal from the first antenna and the local signal, and frequency-converting the radio wave signal;

a third matched filter for receiving the frequency-converted radio wave signal, and outputting the first output signal when a reference signal that becomes a data decision criterion is detected therefrom;

a fourth matched filter for receiving the frequency-converted radio wave signal, and outputting the second output signal when a data signal is detected therefrom;

a second delay time measurer for detecting which of the first output signal and the second output signal has first been output from the third and fourth matched filters, and outputting a corresponding detection result; and

a second data decider for receiving the detecting result, and deciding whether the data signal has a first level or a second level out of 2 logical levels,

wherein the first or second delay time measurer comprises a first circuit for receiving the first output signal and calculating a square value or an absolute value of the first output signal, a second circuit for receiving the second output signal and calculating a square value or an absolute value of the second output signal, a first latch for receiving and setting a output signal of the first circuit, a second latch for receiving and setting a output signal of the second circuit, a first memory for reading a output signal of the second latch as the detection result by receiving a output signal of the first latch, a second memory for reading the output signal of the first latch as the detection result by receiving the output signal of the second latch, and a reset section for outputting a reset signal by receiving outputs of the first and second latches.

11. (Currently amended) An ultra wideband radio communication method characterized in that in an ultra wideband radio transmitter,

a delay time controller generates a periodic pulse, inputs the periodic pulse to a first matched filter, outputs the periodic pulse to a second matched filter when transmission data has a first level out of 2 logical levels, and outputs the periodic pulse to a third matched filter when the transmission data has a second level out of 2 logical levels;

the first matched filter outputs a reference signal that becomes a data decision criterion when the periodic pulse is input thereto;

the second matched filter outputs a first data signal a predetermined time ahead of the reference signal when the periodic pulse is input thereto;

the third matched filter outputs a second data signal a predetermined time behind the reference signal when the periodic pulse is input thereto;

an adder adds up outputs of the first to third matched filters; a local oscillator outputs a local signal for frequency-converting a corresponding addition signal at a high frequency band or a low frequency band;

a mixer receives the addition signal and the local signal, and frequency-converts the addition signal; and

an antenna receives the frequency-converted addition signal, and radiates the corresponding signal in the air; and in an ultra wideband radio receiver, an antenna receives the addition signal and outputs the corresponding signal to a mixer;

the mixer receives the addition signal and a local signal that a local oscillator outputs to frequency-convert the addition signal, and frequency-converts the addition signal;

a fourth matched filter receives the frequency-converted radio wave signal, and outputs a first output signal when a reference signal that becomes a data decision criterion is detected therefrom;

a fifth matched filter receives the frequency-converted radio wave signal, and outputs a second output signal when a data signal is detected therefrom;

a delay time measurer detects which of the first output signal and the second output signal has been first output from the fourth and fifth matched filters, and outputs a corresponding detection result; and

a data decider receives the detection result, and decides whether the data signal has a first level or a second level out of 2 logical levels,

wherein the delay time measurer comprises a first circuit for receiving the first output signal and calculating a square value or an absolute value of the first output signal, a second circuit for receiving the second output signal and calculating a square value or an absolute value of the second output signal, a first latch for receiving and setting a output signal of the first circuit, a second latch for receiving and setting a output signal of the second circuit, a first memory for reading a output signal of the second latch as the detection result by receiving a output signal of the first latch, a second memory for reading the output signal of the first latch as the detection result by receiving the output signal of the second latch, and a reset section for outputting a reset signal by receiving outputs of the first and second latches.